SANDIA NATIONAL LABORATORIES
Albuquerque, New Mexico 87185

Effective Date 2-15-94

TITLE: **PERFORMANCE TEST OF FLUKE HYDRA DATA BUCKET (2635A)**

Prepared by: Glen McCoy Date: 2/2/94

SNL Reviewer: Don Fosdick Date: 2/2/94

SNL Approval: F.R. Hurtle Date: 2-3-94

SNL Safety Approval: CJ Mewhinney Date: 2-3-94

MOC Cognizant Department Manager Concurrence: for T.L. Clark Date: 2-10-94

MOC Manager of Industrial Safety: for Linda Calabrese Date: 2-8-94

SNL QA Approval: for Pat Chavez Date: 2-14-94

PURPOSE: The purpose of this document is to provide information about and a method to perform calibration of the FLUKE HYDRA DATA BUCKET model (2635A).

RESPONSIBILITY: It is the responsibility of the person(s) performing this procedure to be familiar with this procedure and references. They are also responsible for assuring that the Datron Autocal Standards Multimeter being used is in current certification. USE OF CALCULATOR REQUIRED for performance test records calculations. After the calibration is completed the Performance Test Record will be submitted to the Calibration Project Leader or alternate for review. The calibration records will then be submitted to SNL QA.

SAFETY: All related documentation should be reviewed for familiarization with safety markings and instructions before operation or service. 30V will be the highest voltage encountered using this procedure.

REFERENCES:

I. FLUKE HYDRA 2635A SERVICE MANUAL

II. PRECISION MULTIMETER: DATRON 1081 REFERENCE MANUAL

III. PRECISION MULTIMETER: DATRON 1281 REFERENCE MANUAL

NOTE: The 1081 specifications and operating instructions apply identically to the 1082. All references to "1081" should be read as "1081 and 1082". The Datron 1281 meter may be used in place of the Datron 1081.

FORMS:

I. Form No. 288 Performance Test of Fluke Hydra Data Bucket 2635A. (Latest Revision)

II. SA-75-71-1 - Standards Laboratory Instrument Record (Latest Revision)

QA RECORDS: Same as Forms listed above.

PROCEDURE:

I. INFORMATION

A. Introduction

These calibration tests for the FLUKE 2635A Data Bucket are performed on station using transfer standards that are traceable to Sandia National Laboratory's Secondary Standards Lab. This procedure is written to maintain the Carlsbad WIPP Site as a CALIBRATION STATION and as such the station is subject to periodic audits by Sandia Secondary Standards Lab. The audit will consist of a review of equipment and techniques used by personnel to establish and maintain a high degree of accuracy as intended by this document.
The calibration is performed on station using a precision Multimeter, and interconnecting wiring as required. The purpose of calibration is to take into account any long term drifts in the components of the instruments and restore measurement accuracy. After all instruments have been certified, the transfer standards are returned to SNLA to close the loop. If the transfer units are out of calibration or found to be defective on their return to SNLA, the entire procedure must be repeated. This method should eliminate the damage caused in shipping and handling as well as the corrosion that occurs when the instruments are removed from the dry salt environment into a humid atmosphere. If careful attention is given to all aspects of this procedure, accurate measurements can be made for all data taken on behalf of the WIPP project.

B. Test considerations

1. Calibration Interval: Initially the test interval will be established as 6 months.

   NOTE: If an instrument is removed from service while being used to collect data. Then it should be calibrated within 3 weeks of removal date. If instrument can not be calibrated because of an abnormal condition then refer to section C. (Definitions).

2. Temperature: The temperature of the environment will be 60 to 78 deg. F. The DATRON 1081 and other standards should be operated in their normal operating position. Avoid direct drafts from air conditioners and allow plenty of room for ventilation.

3. Warm up: It is essential that the instruments have been

fully stabilized if the best results from calibration are to be achieved. At least 2 hours warm up time should be allowed before making comparisons. If AC power is lost for any reason, the warm up should be repeated.

4. Settling Time: Allow 10 seconds settling time after input values have been changed before taking readings.

5. Data Scans: Calibration of the meters must be coordinated with the data scan interval to eliminate interference with normal measurements.

6. Guarding: The local guard condition on the DATRON must be selected.

7. Wiring: Use solid, coated copper wires terminated with gold plated solderless stack up plugs. Pomona model 4897 or equivalent.

8. Handling: The transfer standards must be treated with care. Carrying cases will be provided to hand carry units between Albuquerque and the mine.

C. Definitions

Following are the definitions which describe the actions to be taken during abnormal conditions.

1. Outside Acceptance Tolerance

When a reading is taken which exceeds the limit given on the Performance Test Record, or instrument is inoperable, this represents "Outside Acceptance Tolerance" and requires the following actions:

a. Perform the meter adjustments.

b. The Calibration Project Leader or alternate will perform calculations which establish the percent of error introduced.

(1) If the data are acceptable the Calibration Project Leader or alternate will sign or initial the Performance Test Record indicating this condition.

(2) If the data are questionable or unacceptable, a non-conformance report will be completed. The Performance Test Records and the error calculations will be attached and distributed to the appropriate Principal Investigator.

2. Outside of Adjustment

When a reading is taken which exceeds 50% of the limit given on the Performance Test Record, this represents an "Adjustment Tolerance Trigger" and not an "Outside Acceptance Tolerance" and recommends the following action:

a. Perform the meter adjustments. If it is not possible to bring the readings within the 50% limit but they are still within stated limits then notify the Sandia Calibration Project Leader or alternate.

D. Performance Test Records

Performance Test form 288 (Refer to figure 1) has a column giving the limits to which the meters are to be accepted or rejected. All calibrations are performed in three steps.

1: Record all data without making any adjustments. Check Initial on Performance Test Record.

NOTE: All initial data must be taken for each function to be calibrated before any adjustments are made unless it can be verified that the instrument under test has been out of service (not used to take data) since its last calibration service

2: If required, make adjustments.

3: Read and record all data. Check After Adjustment on Performance Test Record.

II. Equipment Requirements

DATRON Autocal Standard Multimeter Model 1081, 1082, or 1281
EDC-521C D.C. Voltage/Current Calibrator

III. PERFORMANCE TESTS

Before any tests are made with the DATRON, "zero" the meter as follows: Connect a good copper short between the input terminals. Set the meter switches for "DC", "AUTO", "FILTER", and push "ZERO". Wait for the meter to zero itself thru all DC ranges.

IV. ACCURACY VERIFICATION TEST

A. Connect leads from D.C. voltage source to Datron and HYDRA front panel and insert Input Module with connections for channels 1 thru 20. Select channel 0 the function and range on HYDRA and the input level from D.C. voltage source needed for each range,(90MV,300MV,900MV,3V,30V) and record on form 288. Press MON to measure and display the measurement value for channel 0. Write the value read in proper place on form 288, corresponding to the range value.

V. CHANNEL INTEGRITY TEST

A. Verify that the Accuracy Test for channel 0 meets minimum acceptable levels before performing this test. Record on page 3 of form 288, initial and date.

1. Short wires for channel 1 (0 ohms).

2. For channel 1, select the 2-terminal ohms function and 300-ohms range on Hydra. Press MON and ensure that the display reads a resistance of less than or equal to 1.5Ω.

   (This test assumes that lead wire resistances are less than 0.1Ω.)

3. Open the ends of the connection and ensure that the display reads "OL" (overload).

4. Press MON to stop the measurement.

5. Connect test leads from D.C. voltage source to the Input Module test leads (observe proper polarity and correct channel) and to Datron.

6. Select the VDC function and 30-volt range on Hydra and apply 0V dc from the voltage source. Then apply 29V dc input and ensure the display reads between the minimum and maximum values as shown on form 288 for the 0 and 29V dc input levels.

7. Repeat steps 1 thru 6 for each remaining Input Module channel (2 thru 20).

VI. Acceptance Criteria for each step performed.

A. DC VOLTS:

RANGE VOLTAGE	INPUT LEVEL	ACCEPTANCE + or -
90MV	SHORT	.000007
90MV	90MV	.000038
300MV	SHORT	.00002
300MV	150MV	.00007
900MV	900MV	.00030
3V	2.9V	.0012
3V	-2.9V	.0012
30V	29V	.01

B. AC VOLTS: (NOT USED)

C. RESISTANCE:

Range	Input Level	Accuracy Min	Max
Using inputs in decades of 3:			
300Ω	short	0.00	0.09
	300Ω	299.80	300.27
3 kΩ	short	0.0000	0.0009
	3 kΩ	2.9981	3.0020
30 kΩ	30 kΩ	29.980	30.020
300 kΩ	300 kΩ	299.81	300.19
3 MΩ	3 MΩ	2.9979	3.0021
Using inputs in decades of 1.9:			
300Ω	short	0.00	0.09
	190Ω	189.87	190.20
3 kΩ	short	0.0000	0.0003
	1.9 kΩ	1.8987	1.9014
30 kΩ	19 kΩ	18.987	19.013
300 kΩ	190 kΩ	189.87	190.13
3 MΩ	1.9 MΩ	1.8986	1.9014
Using inputs in decades of 1:			
300Ω	short	0.00	0.09
	100Ω	99.82	100.15
3 kΩ	short	0.0000	0.0009
3 kΩ	1 kΩ	0.9992	1.0008
30 kΩ	10 kΩ	9.992	10.008
300 kΩ	100 kΩ	99.92	100.08
3 MΩ	1 MΩ	0.9992	1.0008
10 MΩ*	10 MΩ	9.986	10.014

REVISION SUMMARY

To be completed by procedure's author before final revision is circulated for signatures.

VI. Revisions made: New Procedure

VII. Personnel effected:

(Check appropriate ones)

MOC Craftsman		SNL JOB AREA	
Drilling	____	DAS General	____
Shop	____	DAS B49 Trailer	____
Mechanical	____	DAS Sheds	____
Electrical	____	DAS Equip. Cal. & Inv.	X
Gage	____	Thermocouple	____
Cable/TC	____	Cables	____
U/G DAS	____	Drilling	____
Geotech	____	Gage Installation	____
		Gage Cal. & Removal	____
		Plugging & Sealing	____
		Brine Transport	____
		QA	____
		General	____
		Principal Investigator	____
		Bin Leak Tester	____
		Permeability Testing	____

VIII. Retraining required:

(Circle One)

(Read)/Re-read procedure

Practical demonstration

Other (explain)

Signature of Procedure's Author Glen McCoy Date 2/2/94